Experimental Results for RST

January 17, 2008

With the formulations available at `http://students.sabanciuniv.edu/~elvinc/rst.html`, we tried to solve four problem instances of **RST** using the answer set solver CMODELS (Version3.74) with LPARSE (Version 1.0.17) and MINISAT (Version 2.0), and ILOG OPL (Version 5.5) with CP-OPTIMIZER (Version 1.1) on a machine with Xeon 1.5GHz CPU with 4x512MB RAM running RedHat Linux (Version 4.3). For each instance of **RST**, we considered two instances of **RST-DEC**: one with the optimal value of k, and the other with 1 less than the optimal. Tables below summarize the results of these experiments. In the tables comparing the computation times, a dash - indicates that the problem could not be solved in 900 sec.s. With the CP formulations, a solution could not be found in 900 sec.s.

Table 1. Experimental results for **RST-DEC**: computation times

Problem	# of sink pins	k	CPU time (sec.)	
			ILP – OPL	ASP – CMODELS
A	15	58	4.64	1.38
		57	-	10.38
B	20	68	10.35	2.30
		67	-	18.54
C	25	74	149.94	2.75
		73	-	56.24
D	30	76	265.73	2.76
		75	-	10.91

Table 2. Experimental results for **RST-DEC**: program size

Problem	# of sinks	k	ILP – OPL		ASP – CMODELS	
			# of variables	# of constraints	# of atoms	# of clauses
A	15	58	11776	72243	36643	110381
		57	11776	27477	44155	134516
B	20	68	15616	115429	41989	126943
		67	15616	36597	52003	159131
C	25	74	19456	168277	46200	140060
		73	19456	45717	58891	180863
D	30	76	23296	230699	50248	152784
		75	23296	54837	65389	201423

Table 3. Experimental results with CP formulations using OPL: program size

Problem	# of sinks	k	**RST-DEC**		**RST-DEC** with heuristics		**RST**	
			# of vars	# of constraints	# of vars	# of constraints	# of vars	# of constraints
A	15	58	26419	60307	71186	124210	26420	60306
B	20	68	35054	80357	113887	184760	35055	80356
C	25	74	43689	100407	166250	254910	43690	100406
D	30	76	52324	120457	228187	334660	52325	120456

Table 4. Experimental results for **RST-DEC** with length restrictions: computation times

Problem	# of sink pins	k	l	CPU time (sec.)	
				ILP – OPL	ASP – CMODELS
A	15	58	16	23.27	2.87
B	20	68	19	-	4.50
C	25	74	17	52.99	4.44
D	30	76	21	-	6.13

Table 5. Experimental results for ASP formulation of **TREE** (with $k = 100$) using CMODELS

Problem	A	B	C	D
length of tree	71	79	81	88
CPU time (sec.)	1.72	8.92	5.99	3.62
program size (atoms; clauses)	59526; 210695	86256; 317200	118078; 445261	157163;603716

Table 6. Experimental results for **RST-DEC** (flow-based approach): computation times

Problem	# of sinks	k	CPU time (sec.)	
			ILP – OPL	ASP – CMODELS
A	15	58	1.92	23.58
		57	1.88	-
B	20	68	2.48	226.11
		67	2.37	-
C	25	74	3.05	62.70
		73	3.04	-
D	30	76	3.76	231.74
		75	4.03	-

Table 7. Experimental results for **RST-DEC** (flow-based approach): program size

Problem	# of sinks	k	ILP – OPL		ASP– CMODELS	
			# of variables	# of constraints	# of atoms	# of clauses
A	15	58	8524	10241	109851	362881
B	20	68	11144	13561	139485	463117
C	25	74	13764	16881	168175	560520
D	30	76	16384	20201	196489	656787

Table 8. Experimental results for ILP formulation of **RST** (flow-based approach): computation times of OPL

Problem	A	B	C	D
CPU time (sec.)	1.8	2.1	2.62	3.34